

APPENDIX D

HAZARDOUS SUBSTANCES MANAGEMENT PLAN

D.0 INTRODUCTION

The Cave Gulch/Bullfrog/Waltman operators (Operators) propose to explore and develop natural gas reserves in the Cave Gulch/Bullfrog/Waltman area of Natrona County, Wyoming. The Bureau of Land Management (BLM) has prepared an Environmental Impact Statement (EIS) for the proposed project, and this Hazardous Substance Management Plan (HSMP), which is included as an appendix to the EIS, provides further specific information regarding the types and quantities of hazardous and extremely hazardous substances that are expected to be produced or used for the proposed project. Detailed descriptions of the proposed action and alternatives, the potential environmental consequences, and proposed mitigation and monitoring measures are provided in the EIS.

This HSMP is provided pursuant to BLM Instruction Memoranda Numbers WO-93-344 and WY-94-059, which require that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and/or extremely hazardous substances that would be produced, used, stored, transported or disposed of as a result of a proposed project. Hazardous substances, as defined herein, are those substances listed in the Environmental Protection Agency's (EPA's) *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, and extremely hazardous substances are those identified in the EPA's *List of Extremely Hazardous Substances* (40 Code of Federal Regulations [CFR] 355). The Operators have reviewed these EPA lists, as amended, and substances included on either of these two lists that could be present in any amount over the life of the proposed project are listed and/or discussed herein.

Some potentially hazardous substances that may be used in small, unquantifiable amounts have been excluded from this HSMP. These substances may include: wastes, as defined by the Solid Waste Disposal Act; wood products; manufactured items and articles which do not release or otherwise result in exposure to a hazardous substance under normal conditions of use (i.e., steel structures, automobiles, tires, etc.); food, drugs, tobacco products, and other miscellaneous substances (i.e., WD-40, gasket sealants, glues, etc.). No unauthorized use or disposal of these substances by project personnel would occur during project implementation, and all project personnel would be directed to properly dispose of these substances in an appropriate manner. Solid wastes generated at well locations would be collected in approved waste containers (e.g., trash baskets or dumpsters), and each well location would be provided with one or more such containers during drilling and completion operations. Solid wastes would be regularly removed from well locations and transported off the Cave Gulch/Bullfrog/Waltman project area to approved disposal facilities.

D.1 HAZARDOUS SUBSTANCES

A listing of all relevant known hazardous and extremely hazardous substances that may be used, produced, stored, or disposed of during project implementation is provided herein. Where possible, the quantities of these substances have been estimated on a per-well basis and their use, storage, and disposal methods described.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

D.2 PRODUCTION PRODUCTS

The purpose of the proposed project is to extract natural gas and oil (condensates) from the Fort Union and Lance Formations and other formations underlying the project area. Water would also be produced as a by-product of gas and oil extraction operations. Table C-1 lists and quantifies, where possible, the hazardous and extremely hazardous materials that may be found in these production products.

D.2.1 Natural Gas

Natural gas, primarily containing methane and ethane would be produced from approximately 200 wells at rates of up to 20 million cubic feet per day (mmcf) from a few wells and rates of 1.5 mmcf or less from the balance of the wells. Production will decline quickly after initial production. No extremely hazardous substances are anticipated to be produced with the gas stream; however, the hazardous substances hexane (CAS Number 110-54-3), benzene (CAS Number 71-43-2), ethyl benzene (CAS Number 100-41-4), toluene (CAS Number 108-88-3), and xylene (CAS Number 133-02-07) would be present in the gas stream at concentrations less than 0.084 percent by volume. In addition, the gas would also likely contain small amounts of potentially hazardous polycyclic organic matter and polynuclear aromatic hydrocarbons. No other hazardous materials are known to occur within the natural gas stream.

The majority of gas produced from Cave Gulch/Bullfrog/Waltman wells would be transported from each location through newly constructed pipelines linking well locations to existing or newly constructed gas processing facilities. The natural gas would eventually be delivered to consumers for combustion. Small quantities of natural gas may be vented or flared at certain well locations during well testing operations. During testing, produced gas would be vented or flared into a flare pit pursuant to BLM/Wyoming Oil and Gas Conservation Commission (WOGCC) rules and regulations (Notice to Lessees [NTL]-4A). BLM and WOGCC approval would be obtained prior to flaring or venting operations. No natural gas storage is anticipated.

Industry standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of the project to ensure pipeline safety and efficiency. All necessary authorizing actions for natural gas pipelines would be addressed prior to installation.

These actions include:

- Natrona County special use permits,
- BLM rights-of-way (ROWs) applications,
- Conformance with U.S. Department of Transportation (DOT) pipeline regulations (49 CFR191-192), and
- Wyoming Public Service Commission Certificates to act as common carrier for natural gas.

D.2.2 Condensates

Condensates would be produced with the gas stream at most of the proposed wells. Condensates primarily consist of long chain hydrocarbon liquids (e.g., octanes), but may also contain variable

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

quantities of polycyclic organic matter and polynuclear aromatic hydrocarbons. Hazardous substances hexane (CAS Number 110-54-3), benzene (CAS Number 71-43-2), ethyl benzene (CAS Number 100-41-4), toluene (CAS Number 108-88-3), and xylenes (CAS Number 133-02-07) are expected to be present at concentrations up to 1.772 percent by volume (Table D-1). No other hazardous or extremely hazardous substances are known to be present in the condensates. The volume of condensate produced

Table D-1. Hazardous and Extremely Hazardous Materials Potentially Produced by the Cave Gulch/Bullfrog/Waltman Natural Gas Project, Natrona County, Wyoming.

Production Product	Hazardous Constituents ¹	Extremely Hazardous Constituents ²	Approximate Quantity Produced per Well ³
Natural Gas	-- Hexane Benzene Ethyle Benzene Toluene Xylenes PAHs ⁴ POM ⁵	None	0.5 -20 mmcf 0.001 - 0.84 percent 0.0 - 0.011 percent 0.001 - 0.002 percent 0.002 - 0.031 percent 0.002 - 0.020 percent
Condensates	-- Hexane Benzene Ethyl Benzene Toluene Xylenes PAHs POM	None	40 -4200 gpd 2.4 percent 0.36 percent 0.17 percent 1.78 percent 1.90 percent
Produced Water	-- Lead Cadmium Chromium Radium 226 Uranium	None	420 gpd

- 1 - The hazardous constituents listed are, to the best of our present knowledge, those that are or may be present in the production products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.
- 2 - Extremely hazardous materials are those defined in 40 CFR 355.
- 3 - mmcf = million cubic feet per day.
mcf = thousand cubic feet per day.
gpd = gallons per day.
percent = percent by volume
- 4 - PAHs = polynuclear aromatic hydrocarbons.
- 5 - POM = polycyclic organic matter.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

from Cave Gulch/Bullfrog/Waltman wells is anticipated to be up to 5000 gallons per day (gpd) from a few wells but less than 420 gpd from most wells (Table D-1).

Condensates would be stored in tanks at well locations and centralized facilities, and all tanks would be fenced and bermed to contain at least 125% of the entire storage capacity of the largest tank. Condensates would be periodically removed from storage tanks and transported off the project area or collected in a stabilization system. All necessary authorizing actions for the production, storage, and transport of condensates, including the Oil Pollution Act of 1990 (storage of >1,000,000 gal) as necessary, would be addressed prior to the initiation of condensate production activities.

D.2.3 Produced Water

Produced water from Cave Gulch/Bullfrog/Waltman wells is anticipated to range in volume from 40 to 4200 gpd, and would average approximately 210 gpd for most wells (Table C-1). Produced water quality from the wells is variable and would be monitored periodically. Based on WOGCC-required water quality analyses of produced water samples from several wells, no hazardous or extremely hazardous substances are known to be present in the produced water.

Produced water would be stored in tanks at well locations and centralized facilities and would periodically be removed and transported by truck to an existing permitted disposal well facility or evaporation pond. Where applicable, National Pollutant Discharge Elimination System (NPDES) permits would be obtained from the WDEQ, and produced water that meets applicable standards would be discharged to the surface at appropriate locations. All necessary authorizing actions would be met prior to the disposal of produced water including:

- BLM approval of disposal methodologies,
- RCRA compliance as necessary,
- WDEQ Water Quality Division (WDEQ-WQD) and/or WOGCC approval of wastewater disposal,
- WOGCC and/or WDEQ-WQD evaporation pond permits, and
- Wyoming State Engineer's Office (SEO) dewatering permits (Form U.W. 5).

D.4 CONSTRUCTION, DRILLING, PRODUCTION, AND RECLAMATION

Known hazardous and extremely hazardous substances that may be used during construction, drilling, production, and reclamation operations for the proposed project are listed at the end of this appendix. Hazardous and extremely hazardous substances used during typical project implementation fall into the following categories:

- fuels,
- lubricants,
- coolant/antifreeze and heat transfer agents,
- drilling fluid additives,

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

- fracturing fluids,
- cement and additives, and
- miscellaneous materials.

These substances are described in detail below.

D.4.1 Fuels

Gasoline (CAS 8006-61-9), diesel fuel (CAS 68476-30-2), and natural gas are the fuels proposed for use on the project, and all contain substances deemed hazardous. Gasoline would be used to power vehicles providing transportation to and from the project area; diesel fuel would be used to power transport vehicles, drilling rigs, and construction equipment, and as a component of fracturing fluids (see Section C.4.5); and natural gas would be used to power pipeline compressor stations.

Gasoline. Gasoline would be used to power vehicles traveling to and from the project area. The hazardous substances present in gasoline include: benzene (CAS 71-43-2), toluene (CAS 108-88-3), ethylbenzene (CAS 100-41-4), xylenes (CAS 130-02-07), m-xylene (CAS 108-38-3), o-xylene (CAS 95-47-6), methyl tert-butyl ether (CAS 1634-04-4), polynuclear aromatic hydrocarbons, and polycyclic organic matter.

Gasoline would be purchased from regional vendors, and would primarily be stored and transported in vehicle gas tanks. Some additional gasoline storage may be provided in appropriately designed and labeled 1 to 5 gallon containers for supplemental use as vehicle fuel. Gasoline would be used exclusively as a fuel for transport vehicles, being burned in internal combustion engines. No large scale storage of gasoline is anticipated.

Diesel Fuel. Diesel fuel for vehicle use would be used, transported, and stored as described in the sub-section above under gasoline. Additional diesel fuel would be utilized to power drilling rigs, workover rigs, pumping equipment, and road maintenance and reclamation equipment. Diesel fuel would also be used as a minor fracturing fluid constituent (see Section C.4.5).

Diesel fuel consists mainly of hydrocarbons containing from 15 to 25 carbons, and potentially containing hazardous substances, including: benzene, toluene, ethylbenzene, p-xylene, m-xylene, o-xylene, methyl tert-butyl ether, naphthalene, polynuclear aromatic hydrocarbons, and polycyclic organic matter. No extremely hazardous substances are known to be present in diesel fuel.

During drilling operations, each well location would have an above-ground storage tank containing diesel. These tanks would be filled as needed by a qualified, licensed fuel supplier, and use, transport, and storage of diesel fuel would be conducted in accordance with all relevant state and/or federal rules, regulations, and guidelines.

Natural Gas. An unknown volume of natural gas would be burned to provide power for the natural gas compressor stations required for efficient pipeline function. The natural gas used to power compressor stations would be produced by the proposed project, and hazardous substances possibly contained in this natural gas are hexane, benzene, ethyl benzene, toluene, eylesnes, polynuclear aromatic hydrocarbons and polycyclic organic matter. Further detail on the

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

transportation of natural gas as a result of the proposed project as well as relevant authorizing actions for natural gas transportation, are provided in Section C.2.1.

D.4.2 Lubricants

Various lubricants including motor oils, hydraulic oils, transmission oils, compressor lube oils, and greases, would be utilized for project-required vehicles, rigs, compressors, and other machinery. Some of these lubricants would likely contain polynuclear aromatic hydrocarbons and polycyclic organic matter, and some may additionally contain compounds of lead, cadmium, nickel, copper, manganese, barium, zinc, and/or lithium. No extremely hazardous substances are known to be present in the lubricants required for the proposed project.

The exact quantity of each lubricant used, stored, transported, and disposed of is unknown; however, all lubricants would be used, stored, transported, and disposed of following manufacturer's guidelines. No unauthorized disposal of lubricants (e.g., disposal of used motor oil) would occur in connection with the project.

D.4.3 Coolant/Antifreeze and Heat Transfer Agents

Ethylene glycol (CAS 107-21-1) and triethylene glycol (CAS 112-27-6) would be utilized as coolant/antifreeze and heat transfer agents in association with this project. Ethylene glycol would be used as an engine coolant/antifreeze in automobiles, construction equipment, gas dehydrators, and drilling and workover rigs. An unspecified volume of this substance would be stored and transported in engine radiators. In addition, both ethylene glycol and triethylene glycol would be used as heat transfer fluids during well completion and maintenance operations. While the exact total volume of ethylene glycol to be used, stored, transported, and disposed of for the proposed project is unknown, any disposal of ethylene glycol and/or triethylene glycol would be conducted in accordance with all relevant federal and state rules and regulations.

D.4.4 Drilling Fluids and Additives

Fresh water would be used for drilling the first 5,000 to 7,000 feet of each well, and water-based muds (drilling fluids) would be used for drilling deeper portions of typical wells. Drilling fluids consist of clays and other additives that are used in standard industry procedures. All drilling operations would be conducted in compliance with applicable BLM, WOGCC, and WDEQ rules and regulations.

Wells drilled to depths greater than approximately 15,000 feet would use oil-based fluids. The oil is identical to diesel fuel and contains the same hazardous constituents, but lacks motor vehicle fuel additives. Many of the same additives used in water-based fluids are also used in the oil-based mixtures.

All known hazardous substances that may be present in the proposed drilling fluids and additives are listed at the end of this appendix. No extremely hazardous substances are known to be present in any of the drilling fluids and additives.

Drilling fluid additives would be transported to well locations during drilling operations in appropriate sacks and containers in compliance with DOT regulations. Water-based drilling fluids, cuttings, and

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

water would be stored in reserve pits, and pits would be fenced to protect wildlife from exposure. Oil-based fluids would be stored in tanks and circulated through a closed system of tanks while drilling. Oil-based fluids will not be placed in pits.

When the reserve pit is no longer required, its contents would be evaporated or solidified in place, and the pit backfilled, as approved by the BLM. All reserve pit solidification procedures using flyash or other BLM-approved materials would be approved by the WOGCC and/or WDEQ prior to implementation. If necessary under special, unanticipated circumstances, reserve pit contents would be removed and disposed of at an appropriate facility in accordance with all relevant state and federal regulations. Oil-based fluids are recycled for use on another well.

D.4.5 Fracturing Fluids

Hydraulic fracturing is expected to be performed at many Cave Gulch/Bullfrog/Waltman wells to augment gas flow rates. The hazardous substances present in fracturing fluid components are listed at the end of this appendix. No extremely hazardous substances are known to be present in any of the fracturing fluid additives.

Fracturing fluids and additives would be transported to well locations in bulk or in appropriately designed and labeled containers. All transportation of fracturing fluids and additives would be in adherence with DOT rules and regulations.

During fracturing, fluids are pumped under pressure down the well bore and out through perforations in the casing into the formation. The pressurized fluid enters the formation and induces hydraulic fractures. When the pressure is released at the surface, a portion of the fracturing fluids would be forced to the well bore and up into a tank or pit. The fracturing fluids would then be transferred to reserve pits and evaporated, or hauled away from the location and reused or disposed of at an authorized facility. Decisions regarding the appropriate disposal of fracturing fluids would be made by the BLM on a case-by-case basis.

D.4.6 Cement and Additives

Well completion and abandonment operations would entail cementing and plugging various segments of the well bore to protect freshwater aquifers and other down-hole resources. Materials potentially used for cementing operations include: cement, calcium hydroxide, calcium chloride, pozzlans, sodium bicarbonate, potassium chloride, and insulating oil. An unknown quantity of cement and additives, which may contain the hazardous material classes of fine mineral fibers, polycyclic organic matter, and polynuclear aromatic hydrocarbons, would be transported in bulk to each well site by a qualified cement supply company. Small quantities may be transported and stored on-site in 50 pound sacks. Wells would be cased and cemented as directed and approved by the BLM (for federal minerals) and WOGCC (for state and patented minerals). No extremely hazardous substances are known to be present in the cement and additives proposed for use on this project.

D.4.7 Miscellaneous Materials

Miscellaneous materials, potentially containing hazardous and/or extremely hazardous substances which may be used for the proposed project include methanol and corrosion inhibitors. These

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

substances would be transported to the site by qualified service and supply companies and would be used and disposed of following manufacturer's guidelines.

An unknown quantity of methanol would be used to de-ice well bores and as a hydrate preventer during completion and natural gas transport operations. Methanol is a listed hazardous chemical and would be stored, transported, used, and disposed of in adherence with all applicable federal and state rules, regulations, and guidelines.

D.5 COMBUSTION EMISSIONS

Combustion emissions from gasoline and diesel engines, as well as flaring natural gas, will occur as a result of this project. The complete oxidation of hydrocarbon fuels yields only carbon dioxide and water as combustion products; however, complete combustion is seldom achieved. Unburned hydrocarbons, particulate matter (e.g., carbon, metallic ash), carbon monoxide, nitrogen oxides, and possibly sulfur oxides would be expected as direct exhaust contaminants. Secondary contaminants would likely include the formation of ozone from the photolysis of nitrogen oxides. A listing of the hazardous and extremely hazardous substances potentially present in combustion emissions is provided in Table D-2. Secondary contaminants would likely include the formation of ozone from the photolysis of nitrogen oxides. A listing of the hazardous and extremely hazardous substances potentially present in combustion emissions is provided in Table D-2.

Table D-2. Hazardous and Extremely Hazardous Materials Potentially Present in Combustion Emissions of the Cave Gulch/Bullfrog/Waltman Natural Gas Project, Natrona County, Wyoming.

Emission	Hazardous Constituents ¹	Extremely Hazardous Constituents ²
Hydrocarbons	-- PAHs ³	None
Particulate Matter	-- Lead Cadmium Nickel Copper Manganese Barium Zinc Lithium	None
Gases	-- Nitrogen dioxide Sulfur dioxide Sulfur trioxide Ozone	-- Nitrogen dioxide Sulfur dioxide Sulfur trioxide Ozone

- 1 - The hazardous constituents listed are, to the best of our present knowledge, those that are or may be present in the production products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.
- 2 - Extremely hazardous materials are those defined in 40 CFR 355.
- 3 - PAHs = polynuclear aromatic hydrocarbons.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Unburned hydrocarbons may contain potentially hazardous polynuclear aromatic hydrocarbons, and particulate matter may contain metal-based particulates from metallic lubricating oil additives, and engine wear particulates (Table C-3). Hazardous substances in the particulate matter may therefore include compounds of lead, cadmium, nickel, copper, manganese, barium, zinc, and/or lithium.

Nitrogen dioxide (CAS 10102-44-0), sulfur dioxide (CAS 7446-09-5), sulfur trioxide (CAS 7446-11-9), and ozone (CAS 10028-15-6) are probable combustion emissions, all classified as extremely hazardous substances. These substances would be either directly released in minor quantities from internal combustion engines, or would be formed through photolysis (i.e., ozone). No releases of these or other materials would occur in excess of those allowed for Prevention of Significant Deterioration Class II areas, WDEQ-Air Quality Division Implementation Plan, nor would releases occur that jeopardize National Ambient Air Quality Standards for the project area. Particulate matter emissions and larger unburned hydrocarbons would eventually settle out on the ground surface, whereas gaseous emissions would react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

D.6 MANAGEMENT POLICY AND PROCEDURE

The Cave Gulch/Bullfrog/Waltman operators and their contractors would ensure that all production, use, storage and disposal of hazardous and extremely hazardous substances as a result of the proposed project would be in strict accordance with all applicable existing, or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All project-related activities involving the production, use, storage and/or disposal of hazardous or extremely hazardous substances would be conducted in such a manner as to minimize potential environmental impacts.

The operators would comply with emergency reporting requirements for releases of hazardous substances. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980*, as amended. The substances for which such notification must be given are the extremely hazardous substances listed under the *Emergency Planning and Community Right to Know* Section 302 and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, prompt notice of the release would be given to the BLM's Authorized Officer and all other appropriate federal and state agencies. Additionally, notice of any spill or leakage (i.e., undesirable event), as defined in BLM NTL-3A, would be given by the operators to the Authorized Officer and other such federal and state officials as required by law.

The operators have evaluated field operations in the project area and have prepared or would prepare and implement plans and/or policies to ensure environmental protection from hazardous and extremely hazardous substances. These plans/policies include, where applicable:

- Spill Prevention, Control and Countermeasures (SPCC) plans for each facility;
- spill response plans;
- inventories of hazardous chemical categories pursuant to Section 312 of the SARA, as amended; and
- emergency response plans.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Development operations in the Cave Gulch/Bullfrog/Waltman area would be in compliance with regulations promulgated under the Resource Conservation and Recovery Act (RCRA), Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act (SWDA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Act (OSHA), and the Federal Clean Air Act (CAA). In addition, project operations would also comply with all attendant state rules and regulations relating to hazardous substance reporting, management and disposal. Table C-3 lists potential hazardous chemical categories for the oil and gas industry.

Table D-3. Generic List of Hazardous Chemical Catagories for the Oil and Gas Exploration and Production Industry.

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLS, unless noted otherwise)
Acids Hydrochloric Acid (<30%)(CAS#7647-01-0)	Immediate (Acute)	10-50
Alkalinity and pH Control Materials Calcium hydroxide (CAS#1305-62-0) Potassium hydroxide (CAS#1310-58-3) Soda ash (CAS#497-19-8) Sodium bicarbonate (CAS#144-55-8) Sodium carbonate (CAS#497-19-8) Sodium hydroxide (CAS#1310-73-2)	Immediate (Acute)	500-1000 lbs.
Biocides Amines Glutaraldehyde (CAS#111-30-8) Isopropyl alcohol (CAS#67-63-0) Thiozolin Acrolein (CAS#107-02-8) Anhydrous Ammonia Formaldehyde	Immediate (Acute), Fire Fire, Sudden release of pressure, Immediate(Acute) Sudden release of pressure, Immediate(Acute) Fire, Immediate (Acute), Delayed (Chronic)	2-20 1-2 1-2 2-20
Breakers Ammonium persulfate (CAS#7727-54-0) Benzoic acid (CAS#65-85-0) Enzyme Sodium acetate (CAS#127-09-3) Sodium persulfate (CAS#7772-27-1)	Immediate (Acute), Fire	0-500 lbs.
Buffers Sodium acetate (CAS#127-09-3) Sodium bicarbonate (CAS#144-55-8) Sodium carbonate (CAS#497-119-8) Sodium deacetate	Immediate (Acute)	500-1000
Calcium Compounds Calcium bromide (CAS#71626-99-8) Calcium hypochlorite (CAS#7778-54-3) Calcium oxide (CAS#1305-78-8) Gypsum (CAS#10101-41-4) Lime (CAS#1305-78-8)	Immediate (Acute)	1000-3000 lbs.
Cement (CAS#65997-15-1)	Immediate (Acute)	1000-1500 lbs.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Cement Additives - Accelerators Calcium chloride (CAS#10035-04-8) Gypsum (CAS#10101-41-4) Potassium chloride Sodium chloride (CAS#7647-14-5) Sodium metasilicate Cement Additives - Fluid Loss Cellulose polymer Latex	Immediate (Acute) Immediate (Acute)	5000-20,000 lbs. 50-1000 lbs.
Cement Additives - Miscellaneous Cellulose flakes (CAS#9004-34-6) Coated aluminum Gilsonite (CAS#12002-43-6) Lime (CAS#1305-78-8) Long chain alcohols	Immediate (Acute)	0-500 lbs.
Cement Additives - Retarders Cellulose polymer Lignosulfonates	Immediate (Acute)	0-1000 lbs.
Cement Additives - Weight Modification Barite (CAS#7727-43-7) Bentonite Diatomaceous earth (CAS#68855-54-9) Fly ash Glass beads Hematite (CAS#1317-60-8) Ilmenite Pozzolans	Immediate (Acute)	500-20,000 lbs.
Corrosion Inhibitors 4-4' Methylene dianiline (CAS#101-77-9) Acetylenic alcohols Amine Formulations Ammonium bisulfite (CAS#10192-30-0) Basic zinc carbonate (CAS#3486-35-9) Gelatin Ironite sponge (CAS#1309-37-1) Sodium chromate (CAS#7775-11-3) Sodium dichromate (CAS#10588-01-9) Sodium polyacrylate Zinc lignosulfonate Zinc oxide (CAS#1314-13-2)	Immediate (Acute), Delayed (chronic), Fire	2-20
Crosslinkers Boron Compounds Organo-metallic complexes	Immediate (Acute), Fire	300-500 lbs.
Defoaming Agents Aluminum stearate Fatty acid salt formation Mixed alcohols Silicones	Immediate (Acute)	1-5

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Deflocculants Acrylic polymer Calcium lignosulfonate Chrome-free lignosulfonate Chromium lignosulfonate Iron lignosulfonate Quebracho Sodium acid pyrophosphate (SAPP) Sodium hexametaphosphate (CAS#10124-56-8) Sodium phosphate (oilfos) Sodium tetraphosphate Stryene, maleaic anhydride co-polymer salt Sulfo-methylated tannin	Immediate (Acute)	500-1000 lbs.
Detergents/Foamers Amphoteric surfactant formulation Ethoxylated phenol Detergents	Immediate (Acute), Fire	2-20
Explosives Charged well jet perforating gun, Class C explosives Detonators, Class A explosives Explosive power device, Class B	Sudden release of pressure	0-100 lbs.
Filtration Control Agents Acrylamide AMPS copolymer Aniline formaldehyde copolymer hydrochlorite Causticized leonardite Sulfomethylated phenol formaldehyde Leonardite Partially hydrolyzed polyacrylamide Polyalkanolamine ester Polyamine acrylate Polyanionic cellulose Potassium lignite Preserved starch Sodium carboxymethyl cellulose (CAS#9004-32-4) Starch (CAS#9005-25-8) Vinylsulfonate copolymer	Immediate (Acute)	20-200
Friction Reducers Acrylamide methacrylate copolymers Sulfonates	Immediate (Acute)	2-20
Fuels Diesel (CAS#68476-34-6) Fuel oil Gasoline (CAS#8006-61-9) Kerosene (CAS#8008-20-6) Propane (CAS#74-98-6)	Immediate (Acute), Delayed (Chronic), Fire	200-400
Gelling Agents Cellulose and guar derivatives	Immediate (Acute)	1500-5000 lbs.
Gel Stabilizers Sulfites Thiosulfates	Immediate (Acute)	1-2

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Heat Transfer Fluids Ethylene Glycol (CAS# 107-21-1) Freon	Immediate (Acute, Delayed (Chronic)	20-200
Herbicides	Immediate (Acute)	2-20
Hydraulic Fluids	Fire, Immediate (Acute)	2-20
Inert Gases Carbon Dioxide (CAS#124-38-9) Nitrogen (CAS#7727-37-9)	Immediate (Acute), Sudden release of pressure	0-400 tons
Lost Circulation Materials Cane fibers Cedar fibers Cellophane fibers Corn cob Cottonseed hulls Mica (CAS#12001-26-2) Nut shells Paper Rock wool Sawdust	Immediate (Acute)	0-1000 lbs.
Lubricants, Drilling Mud Additives Graphite (CAS#7782-42-5) Mineral oil formulations Organo-fatty acid salt Vegetable oil formulations Walnut Shells	Immediate (Acute)	2-20
Lubricants, Engine Motor oil Grease	Immediate (Acute)	2-20
Miscellaneous Drilling Additives Diatomaceous Earth (CAS#68855-54-9) Oxalic acid (CAS#144-62-7) Potassium acetate (CAS#127-08-2) Zinc bromide (CAS#7699-45-8)	Immediate (Acute), Delayed (Chronic)	100-500 lbs.
Odorants Mercaptans, aliphatic	Immediate (Acute)	0-1
Oil Based Mud Additives Amid polymer formulations Amine treated lignite Asphalt Diesel (CAS#68476-34-6) Gilsonite (CAS#12002-43-6) Mineral oil Organophilic clay Organophilic hectorite Petroleum distillate (CAS#8030-30-6) Polymerized organic acids Sulfonate surfactant	Immediate (Acute), Delayed (Chronic), Fire	20-200 bbl (liquids) 50-500 lbs (dry)

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Paint and Paint Thinner	Fire, Delayed (Chronic)	5-50 gals
Pipe Joint Compound	Delayed (Chronic)	1-2
Organic Acids Acetic acid (CAS#64-19-7) Acetic anhydride (CAS#108-24-7) Benzoic acid (CAS#65-85-0) Citric acid (CAS#5949-29-1) Formic acid (CAS#64-18-6) Organic acid salts	Immediate (Acute), Fire	2-20
Produced Hydrocarbons Condensate Crude oil (CAS#8002-05-9) Natural Gas	Immediate (Acute), Delayed (Chronic), Fire, Sudden release of pressure	2000-20,000
Proppants Bauxite (CAS#1318-16-7) Resin coated sand Zirconium proppant	Immediate (Acute)	50,000-600,000 lbs.
Resin and Resin Solutions Melamine resins Phenolic resins Polyglycol resins	Immediate (Acute), Fire	1-2
Salt Solutions Aluminum chloride (CAS#7446-70-0) Ammonium chloride (CAS#12125-02-9) Calcium bromide (CAS#17626-99-8) Calcium chloride (CAS#10035-04-8) Calcium sulfate (CAS#778-18-9) Ferrous sulfate (CAS#7782-63-0) Potassium chloride (CAS#7447-40-7) Sodium chloride (CAS#7647-14-5) Sodium sulfate (CAS#7757-82-6) Zinc bromide (CAS#7699-45-8) Zinc chloride (CAS#7646-85-7) Zinc sulfate	Immediate (Acute)	2000-20,000
Scale Inhibitors Ethylenediaminetetraacetic acid (EDTA) (CAS#60-00-4) Inorganic phosphates Isopropanol (CAS#67-63-0) Nitrilotriacetic acid (NTA) (CAS#139-13-9) Organic phosphates Polyacrylate Polyphosphates	Immediate (Acute), Fire	20-200
Shale Control Additives Hydrolyzed polyacrylamide polymer Organo-aluminum complex Polyacrylate polymer Sulfonated asphaltic residuum	Immediate (Acute)	20-200
Silica	Immediate (Acute), Delayed (Chronic)	2000-20,000 lbs.

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Solvents 1,1,1-Trichloroethane (CAS#71-55-6) Acetone (CAS#67-64-1) Aliphatic hydrocarbons Aromatic naphtha (CAS#8032-32-4) Carbon tetrachloride (CAS#56-23-5) Diacetone alcohol Ethylene glycol monobutyl ether (CAS#111-76-2) Kerosene (CAS#8008-20-6) Isopropanol (CAS#67-63-0) Methyl ethyl ketone (MEK) (CAS#78-93-3) Methyl isobutyl ketone (MIBK) (CAS#108-10-1) Methanol (CAS#67-56-1) t-Butyl alcohol (CAS#75-65-0) Toluene (CAS#108-88-3) Turpentine (CAS#8006-64-2) Xylene (CAS#1330-20-7)	Immediate (Acute), Delayed (Chronic), Fire	20-200
Spotting Fluids Nonoil base spotting fluid Oil base spotting fluid (diesel oil base) Oil base spotting fluid (mineral oil base) Sulfonated vegetable ester	Immediate (Acute), Fire	20-200
Surfactants - Corrosive Alcohol ether sulfates Amines Quarternary polyamine Sulfonic acids	Immediate (Acute)	2-20
Surfactants Ethylene Diamine (CAS#107-15-3)	Fire, Immediate (Acute)	2-20
Surfactants - Flammable Amines Ammonium salts Fatty alcohols Isopropanol (CAS#67-56-1) Oxyalkylated phenols Petroleum naphtha (CAS#8030-30-6) Sulfonates	Immediate (Acute), Fire	2-20
Surfactants - Miscellaneous Amine salts Glycols Phosphonates	Immediate (Acute)	2-20
Temporary Blocking Agents Benzoic acid (CAS#65-85-0) Naphthalene (CAS#91-20-3) Petroleum wax polymers Sodium chloride (CAS#7647-14-5)	Immediate (Acute)	2-20
Tracers Ammonium Nitrate Potassium Nitrate	Fire	2-20

APPENDIX D: HADARDOUS SUBSTANCES MANAGEMENT PLAN

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards	Approx. Quantity Onsite (BBLs, unless noted otherwise)
Viscosifiers Attapulgate Bentonite Guar gum (CAS#9000-30-0) Sepiolite Xanthan gum	Immediate (Acute)	1000-5000 lbs.
Weight Materials Barite (CAS#7727-43-7) Calcium carbonate (CAS#1317-65-3) Galena Hematite (CAS#1317-60-8) Siderite	Immediate (Acute)	10,000-150,000 lbs.
Welding Materials Solder Welding Rods	Immediate (Acute)	1-1000 lbs.